REMARKS/ARGUMENTS

In the Office Action dated November 6, 2003, Claims 1-35 are pending, of which Claims 1-20 have been elected for prosecution. Claims 1-12 are rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 5,447,586 to Tam or alternatively U.S. Patent No. 5,177,340 to Zaffiro, either one further in view of U.S. Patent No. 6,466,829 to Sickler and/or U.S. Patent No. 6,476,716 to Ledlow. Claims 13-20 rejected under 35 U.S.C. § 103(a) as being unpatentable over Tam or alternatively Zaffiro, either one in view of Sickler and/or Ledlow and further in view of U.S. Patent No. 5,886,313 to Krause, et al. and/or U.S. Patent No. 5,705,788 to Beyer, et al.

Applicant has amended independent Claims 1 and 13 as set forth above to further clarify the distinctions between the invention as claimed and the cited references.

In particular, Applicant submits that none of the cited references teaches or describes a method of heating a fiber tape including "determining a feedforward control value based only on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface" as now recited in each of Claims 1 and 13.

The Examiner has asserted that "The velocity measurement and the target temperature of the tape are both used in the feedforward calculations of Tam. Finally, the feedforward value is then used to control the torch controller (heat control)." Applicant respectfully submits that Tam does not describe determining a feedforward control value in the recited manner. In fact, neither of the first or second loops **80, 70** described by Tam are used to determine a feedforward control value based on the target temperature and the velocity. Tam teaches that a controller **82** of loop **80** calculates the first component of the velocity command using a temperature error and a gas flow measurement. The second component of the velocity command is calculated using a temperature setpoint and the gas flow. The first and second velocity commands are then added to produce a desired velocity command **85**, which is compared to a user set lower limit **86** and a time varying upper limit **87**. *See* col.4, lines 32 to 63. Neither the first or second component is determined according to the velocity of the tape. Tam also teaches that a second loop **70** of Tam calculates a first component 74 of the gas command using a velocity error (the measured velocity

subtracted from the desired velocity). The desired velocity and the temperature setpoint are used to calculate the second component of the gas command. A velocity saturation **86** is used to calculate the third component of the gas command, and the three components of the gas command are added to form the desired gas command **76**. *See* col. 4, line 64 to col. 5, line 14. Thus, although the gas command may be determined in part according to the temperature setpoint and the velocity, Tam does not describe a feedforward control value that is based on the target temperature and the velocity of the tape according to a feedforward response surface, as claimed.

Moreover, Tam does not describe determining such a feedforward control value "based only on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface." Indeed, the first loop **80** of Tam does not determine a value according to velocity. The second loop **70** of Tam uses a velocity error and a desired velocity in the calculation of gas command. Thus, neither the gas command nor any of the three components of the gas command are based only on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface."

Similarly, Zaffiro does not teach determining a feedforward control value based only on the target temperature of the fiber tape and the velocity of the fiber tape and according to the feedforward response surface." Instead, Zaffiro describes a feed forward predictive component U_{FF} of the control word U_I. *See* col. 9, lines 16 to 51. However, the feed forward predictive component U_{FF} is determined according to Equation 4 shown at col. 9, line 22. Equation 4 is based on the useful heat output of the bulbs **42**, the heat loss and heat load of the system **14**, the heater zone area, and the necessary temperature increase from the unheated tape temperature to the processing temperature. To the extent that errors occur between the desired and actual heated tape temperatures, Zaffiro states that the control word can be adjusted to change the energy level radiated by bulbs from the nominal level directed by the feed forward component, i.e., using a compensation signal U_{COMP}.

Each of the other cited references also fails to disclose determining a feedforward control value as claimed.

For the foregoing reasons, Applicant submits that Claims 1 and 13 are patentable over both Tam and Zaffiro, either alone or in combination with the other cited references. Accordingly, Claims 2-12 and Claims 14-20, which are dependent on Claims 1 and 13, respectively, are also patentable over the cited references.

Further, Applicant submits that dependent Claims 3-12 and 14-20 provide additional bases for patentability over Tam and Zaffiro and are neither anticipated nor made obvious by Tam or Zaffiro, alone or in combination. For example, Claims 2 and 14 state that determining the feedforward control value includes constructing the feedforward data table and retrieving a value from the feedforward data table. Neither Tam nor Zaffiro describe constructing such a table or retrieving a feedforward control value from the table.

Claims 3-7 and Claims 15-19 recite particular steps for constructing the feedforward data table that are not described by Tam or Zaffiro. For example, Claims 3 and 15 recite operating the machine at the predefined velocity, providing the predefined feedforward control value as a heat control value, measuring the resulting temperature of the tape, and storing the predefined velocity, feedforward control value, and resulting temperature as a data point. The Examiner has asserted:

> For example, Tam discloses operating a fiber placement machine at the predefined velocity of the fiber tape, providing the predefined feedforward control value as a heat control value, measuring the resulting temperature of the fiber tape. Also, Zaffiro discloses operating a fiber placement machine at the predefined velocity of the fiber tape, providing the predefined feedforward control value as a heat control value, measuring the resulting temperature of the fiber tap[e].

See page 5 of the Office Action. However, Applicant respectfully submits that neither Tam nor Zaffiro describes providing a predefined feedforward control value as a heat control value and storing such values that result during operation of the machine. Similarly, Claims 4 and 16 recite calculating the resulting temperature and storing the predefined velocity, the predefined feedforward control value, and the resulting temperature. No description for storing such values in a feedforward data table is provided by Tam or Zaffiro. Claims 6 and 18 recite that the feedforward control value is mathematically defined according to the feedforward response

surface. Claims 7 and 19, which are dependent on Claims 6 and 18, respectively, recite the relationship:

$$FCV(t) = B_0 + B_V * V + B_T * T + B_{VT} * V * T + B_{TT} * T^2$$

The Examiner has asserted that "It is well known in the art to define the feedforward control values as equations such as the one claimed, including second order equations. Such is well known in the art and would have been well within the purview of one of ordinary skill in the art to determine the appropriate equation for the particular application." Applicant respectfully disagrees. As set forth above, neither Tam nor Zaffiro discloses calculating a feedforward control value in the specified manner. In fact, neither Tam nor Zaffiro describes a nonlinear relationship between a feedforward control value and temperature. Further, both Tam and Zaffiro disclose determining control values based on various other factors not present in the recited equation. Applicant respectfully requests that the Examiner cite a reference teaching such a feature or withdraw the rejection.

For the foregoing reasons, Applicant submits that Claims 1-20 are allowable.

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CONCLUSIONS

In view of the remarks presented above, Applicant submits that the present application is in condition for allowance. As such, the issuance of a Notice of Allowance is therefore respectfully requested. In order to expedite the examination of the present application, the Examiner is encouraged to contact Applicant's undersigned attorney in order to resolve any remaining issues.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those that may otherwise be provided for in documents accompanying this paper.

However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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CERTIFICATION OF FACSIMILE TRANSMISSION

I hereby certify that this paper is being facsimile transmitted to the US Patent and Trademark Office at Fax No. (703) 872-9306 on the date shown below.

Lorna Morehead — May 14, 2004
Date